2018-10-30 Second-Order ODEs - Modelling (4)

Chapter 4 - Second Order ODEs: Modelling

Q. Model the position y(t) of a keypress of one laptop key

Hints:

- Keys can only move vertically.
- Each key has a spring to make the key return to its original position after being pressed (Hooke's law: force is proportional to the reaction)
- Gravity is much weaker than the spring that keeps the key in place.
- Each key must also include some damping so that it doesn't keep oscillating back and forth once pressed.
- A typical letter key is 15mm x 15mm and when pressed has a maximum displacement of 0.5mm
- Keys last 50 million presses on average.
- On average, a person exerts the force of 42N with one finger on a key.

Using Newton's 2nd law: F=ma

F = 42N

a = y"(t)

y(t) = position of the key relative to equilibrium (no force).